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isogeotherms" (with normal temperature gradient) into the lower beds of a sinking geosynclinal prism—a demonstrably inadequate source of the required heat. On page 174 we have:

Le granite est formé des mêmes éléments caractéristiques que le gneiss. Plusieurs auteurs l'envisageaient, probablement avec raison, comme le terme ultime du métamorphisme, et il convient peut-être d'attribuer la même origine aux roches granitoïdes basiques, à la syenite, à la diorite, au gabbro, etc. (!)

In the table of geological periods we find the traditional but inaccurate names "ère Pri-maire" and "ère Secondaire" used as synonyms for "ère Paléozoïque" and "ère Mésozoïque." The "période Algonkienne" enters the table; it will be interesting to see, in the second volume, what definition a French author can give this expression. For the North American geologist "Algonkian" is hard enough to define; "Algonkian period" is harder to define.

In form of publication the book marks a distinct advance over its only rival in the French language—A. de Lapparent's "Traité de Géologie." The improvement is notable in the style of the letter-press and in the introduction of many attractive illustrations. The book is marred by the lack of an index—a lack which can not be made up by the insertion of a general index in a succeeding volume, for the present thick one should be bound alone. The "Table des Matières" is placed at the end of the volume, where the index would also be placed if it had been printed. One may hope that some day the French will change their tradition and place the table of contents in the front of the book. Who of us has not wasted precious time searching out the "Table des Matières" among the appendixes, plates and index sheets of French texts!

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A Text-Book on Sound. By EDWIN H. BARTON, Professor of Experimental Physics, University College, Nottingham. London, Macmillan and Co., Limited. 1908.

There was need of a treatise on sound, which would neither be taken up wholly with a mathematical discussion of dynamical principles, nor consist merely of experiments, and yet which would so combine these features and so fully cover the subject as to deserve the attention and meet the needs of the serious student of acoustics. Barton's "Text-Book of Sound" occupies such a place.

It is forty-five years since Helmholtz's classic, "Tonempfindungen," appeared, and thirty-one since the publication of Lord Rayleigh's masterly treatise, and in that time no work worthy to rank with these has been produced. The first volume of such a treatise by the late Professor Donkin was published in 1870, and this was of the same order as the two works mentioned, but it is doubtful whether it could have appealed to a large number of readers or to any but most accomplished mathematicians if it had been completed on the lines upon which the initial volume proceeded.

In the past forty years admirable treatises on heat have appeared, keeping pace with the development of the subject, still more on light; while those on electricity have been numerous enough and varied enough to satisfy almost every want; but sound as a branch of physics seems to have been side-tracked. Of course, the subject has been included in all compendiums or treatises on general physics, and to these the author acknowledges his indebtedness.

Barton's "Text-Book of Sound" is admirable on many accounts and has little to object to. Indeed all the material in it is excellent, the principal question in regard to some of it being one as to its relevancy. Unless one admits the propriety of including all wave phenomena in the theory of sound it would seem as if some things here were superfluous. Following approved precedents in defining "Acoustics, or the study of sound, as that branch of physics which deals with vibratory motion as perceived by the sense of hearing," an adherence to this definition might save the author from the necessity of discussing all the causes and peculiarities of wave motion. Pos-

sibly, a full presentation of simple harmonic motion might be appropriate, since all waves, transverse or longitudinal, which result in sound are of that form of motion, but it could hardly be necessary to go into any considerable discussion of elasticity or the determination of elastic constants. It should be sufficient, it would seem, to point out that in accordance with Hooke's law all vibrations due to elasticity are simple harmonic motions. In America, at least, a student capable of reading a work like this intelligently would very probably be so far familiar with the principles of elasticity as to make chapter III. superfluous, and the like would be true regarding some other portions that are not obviously of an acoustic nature. Even if their connection with acoustics is ultimately fundamental, it is so remote as to suggest comparison with the works of a watch which have nothing to do with the case. Their presence, however, is not a serious fault if it secures better treatment of other parts that could not be omitted. It is a question whether simple harmonic motion in connection with sound is not overdone. It is true that elastic vibrations are simple harmonic motions, but so far as sound is concerned its reception by or transmission to the ear is always due to longitudinal vibration, and the intricate composition of transverse vibrations helps very little in interpreting the superposition or interference of longitudinal waves in the medium through which the sound is transmitted. Still, the phonograph and the telephone have of necessity forced the study of acoustics along the line of vibrating plates. It is interesting to note how the very delicate points in acoustics are best appreciated by seeing instead of hearing.

The last chapter, devoted to recorders and reproducers, is most interesting and important, although some of it goes pretty far afield for sound. A good instance is given of rhythm resulting from sound vibrations and, without being itself sound, transmitted electrically as rhythm and perceived by dipping fingers into a conducting liquid. This may illustrate the vibrations of a plate as a source of sound, but they are neither transmitted nor perceived as sound at all, there being no evidence of any

material vibration in the transmitting media or in the organ of perception. Of course this is very different from telephonic reproduction, where there is distinctly a sounding disk at the receiving as well as at the sending terminal. This chapter serves to show how greatly the domain of acoustics has widened since the earlier work of Donkin and Helmholtz, and it also points out how the theory of sound is connected with that of electricity through wave motion. The value of the chapter is heightened by the original work of the author upon electric oscillations.

We notice the introduction of the term sound-rays. Although this is unusual, the use of the term ray to designate a normal to a wave front is becoming so common in textbooks as to justify it in connection with sound, even though the conception of a material ray of sound has never had any favor.

In enumerating several forms of sensitive flames the Govi-Barry flame, which is so easy to produce and so wide in its range of sensibility might well have been included.

A few errors have escaped the proof-reader, but probably not more than are to be expected in a first edition. Such are the omission of an exponent after equation (1) on page 225, and an uncompleted sentence at the top of page 371. But when the few points have been mentioned to which exception might be taken, there remain so many more to be commended that the balance is greatly in favor of the work. The admirable choice and distribution of experiments, the masterly character of the discussions, the ample scope of the work and its attractive typography and make-up, constitute it a welcome addition to the text-books of this division of physics.

D. W. HERING

The Nature and Development of Plants, by CARLTON C. CURTIS, instructor in botany in Columbia University. Henry Holt & Company, publishers.

THOUGH published last year, the book has not yet received, in the way of review, the notice which it deserves. Though not purporting to be a text-book, it nevertheless is a book which may well serve the purpose in the